

CLAIMS

1. A travel safety device for a vehicle comprising:

an object detecting unit which detects an object existing in a traveling direction
5 of the vehicle;

a correlation calculating unit which calculates a correlation involving a distance
between the vehicle and the object on the basis of a detection result of the object
detecting unit;

a safety unit including an automatic brake unit which automatically decelerates
10 the vehicle and a seatbelt device which automatically tightens the seatbelt and releases
the tightening thereof; and

a safety device operation control unit which determines a possibility of a contact
between the vehicle and the object on the basis of the correlation calculated by the
correlation calculating unit and for controlling operation of the safety device when it is
15 predicted that there is a possibility of a contact wherein the safety device operation
control unit simultaneously actuates the automatic brake unit and seatbelt device when it
is predicted that there is a possibility of a contact.

2. The travel safety device for a vehicle according to claim 1, wherein the

20 automatic brake unit is constructed so as to be capable of decelerating the vehicle in a
plurality of different deceleration patterns, and the seatbelt device is constructed so as to
be capable of tightening the seatbelt and releasing the tightening thereof in a plurality of
different operation patterns.

25 3. The travel safety device for a vehicle according to claim 1, wherein the safety

device operation control unit is constructed so that, when the distance between the vehicle and the object enters a predetermined range on the basis of the correlation calculated by the correlation calculating unit, the automatic brake unit causes deceleration of a degree, which is capable of making the occupant recognize that a braking force has been generated, to be generated, and at the same time, the seatbelt device alternates tightening of the seatbelt and releasing thereof.

4. The travel safety device for a vehicle according to claim 3, wherein the safety device operation control unit is constructed so that a further higher degree of deceleration is generated by the automatic brake unit if such a state is maintained for a predetermined period of time, where the distance between the vehicle and the object enters a predetermined range on the basis of the correlation calculated by the correlation calculating unit.

5. The travel safety device for a vehicle according to claim 4, wherein the safety device operation control unit is constructed so that, if such a state is maintained for a predetermined period of time, where the distance between the vehicle and the object enters a predetermined range on the basis of the correlation calculated by the correlation calculating unit, the seatbelt device causes the seatbelt to be fixed in its stopped state for at least a predetermined period of time after the seatbelt is tightened.

6. The travel safety device for a vehicle according to claim 5, comprising:
a braking operation detecting unit which detects a braking operation carried out by a driver; and
a vehicle speed detecting unit which detects the speed of vehicle, wherein the

safety device operation control unit is constructed so that fixing of the seatbelt in its stopped state by the seatbelt device is released in at least one of the states where it is detected on the basis of a detection result of the braking operation detecting unit that a braking operation is released after the braking operation is carried out by a driver and
5 where it is detected on the basis of a detection result of the vehicle speed detecting unit that the vehicle stops.

7. The travel safety device for a vehicle according to claim 1, comprising a braking operation detecting unit which detects a braking operation carried out by a driver,
10 wherein the safety device operation control unit is constructed so that, on the basis of a braking operation detected by the braking operation detecting unit, it determines whether there is a possibility of a contact between the vehicle and the object, and increases a tightening tension of the seatbelt by the seatbelt device in a case in which it is predicted based on a braking operation carried out by a driver that there is a possibility of a contact
15 prior to a case in which it is predicted, on the basis of the correlation between the vehicle and the object, which is calculated by the correlation calculating unit, that there is a possibility of a contact therebetween.

8. The travel safety device for a vehicle according to claim 1, comprising an
20 in-vehicle LAN, wherein the correlation calculating unit, a brake control unit which controls the automatic brake unit and an electric seatbelt control unit which controls the seatbelt device are connected to a connection bus of the in-vehicle LAN.

9. The travel safety device for a vehicle according to claim 1, wherein the
25 operation of the seatbelt device is made different in a case in which there is a possibility

of a contact with a stationary object and in a case in which there is a possibility of a contact with a mobile object.

10. The travel safety device for a vehicle according to claim 1, further comprising a collision sensor which detects a collision of a vehicle, wherein the safety device is further provided with airbag devices, wherein the safety device operation control unit is constructed so that it simultaneously actuates the automatic brake unit and the seatbelt device when it is predicted that there is a possibility of a contact, and actuates the airbag devices when the collision sensor detects collision of the vehicle.

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11. A seatbelt device comprising:

a seatbelt which restrains an occupant of a vehicle in a seat;

a contact predicting unit which predicts a possibility of a contact between the vehicle and an object;

15 an electric motor which tightens the seatbelt when a contact is predicted by the contact predicting unit;

a tightening releasing unit which releases the tightening of the seatbelt; and

a control unit which controls the electric motor and the tightening releasing unit;

wherein the control unit carries out a warning operation to issue an alarm to the

20 occupant by means of the seatbelt by controlling the electric motor and the tightening releasing unit so that tightening of the seatbelt and releasing thereof are alternated.

12. The seatbelt device according to claim 11, wherein a time of tightening the seatbelt in the warning operation is set to be longer than a time of releasing the tightening thereof.

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13. The seatbelt device according to claim 11, wherein the control unit carries out the warning operation on the basis of a prediction signal of the contact predicting unit.
- 5 14. The seatbelt device according to claim 11, wherein the control unit carries out a tightening operation of tightening the seatbelt by means of the electric motor after the warning operation is carried out.